Office de la Propriété Intellectuelle du Canada
Un organisme d'Industrie Canada

Canadian Intellectual Property Office
An agency of Industry Canada

CA 2556525 C 2012/01/24

(11)(21) 2 556 525

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(86) Date de dépôt PCT/PCT Filing Date: 2005/02/11
(87) Date publication PCT/PCT Publication Date: 2005/09/01
(45) Date de délivrance/Issue Date: 2012/01/24
(85) Entrée phase nationale/National Entry: 2006/08/16
(86) N° demande PCT/PCT Application No.: EP 2005/001386
(87) N° publication PCT/PCT Publication No.: 2005/080034
(30) Priorité/Priority: 2004/02/17 (DE20 2004 002 491.8)

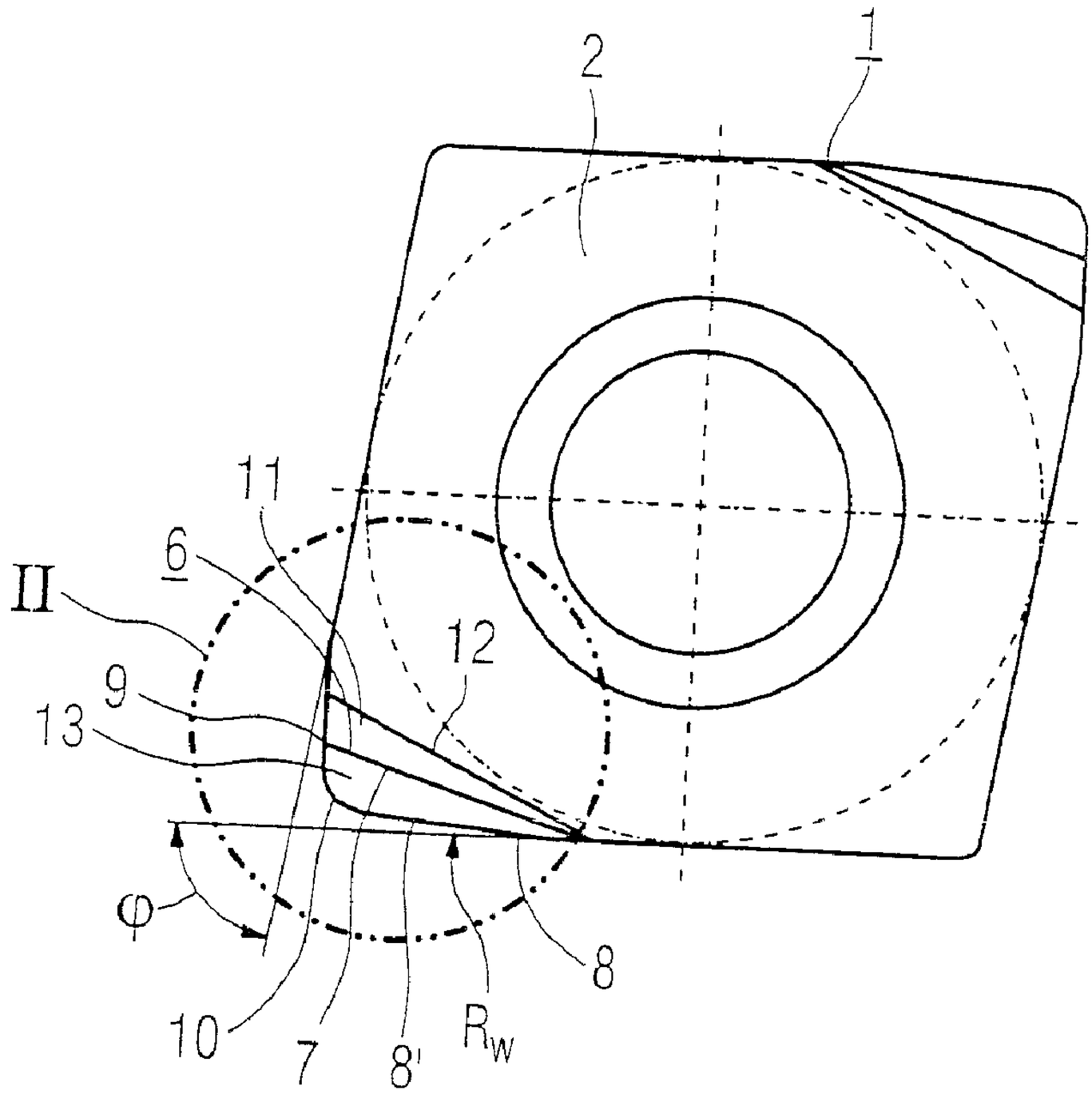
(51) Cl.Int./Int.Cl. *B23B 27/14* (2006.01),
B23B 29/034 (2006.01)

(72) Inventeurs/Inventors:
KRENZER, ULRICH, DE;
JUST, WERNER, DE

(73) Propriétaire/Owner:
KENNAMETAL INC., US

(74) Agent: SMART & BIGGAR

(54) Titre : MATRICE DE DECOUPAGE, NOTAMMENT POUR UN OUTIL D'ALESAGE
(54) Title: CUTTING PLATE, PARTICULARLY FOR A BORING TOOL



(57) Abrégé/Abstract:
The invention relates to a cutting plate (1) comprising a plate surface (2), lateral plate faces (5), a main cutting edge (9) that borders a secondary cutting edge (8) via a corner cutting edge (10), and a chip-forming stage (6) that is located in the zone near the corner and is provided with a stage base (7) which extends from the secondary cutting edge (8) to the main cutting edge (9).

(12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT) VERÖFFENTLICHTE INTERNATIONALE ANMELDUNG

(19) Weltorganisation für geistiges Eigentum
Internationales Büro

(43) Internationales Veröffentlichungsdatum
1. September 2005 (01.09.2005)

PCT

(10) Internationale Veröffentlichungsnummer
WO 2005/080034 A1

(51) Internationale Patentklassifikation[7]: B23B 27/14, 29/034

(21) Internationales Aktenzeichen: PCT/EP2005/001386

(22) Internationales Anmeldedatum:
11. Februar 2005 (11.02.2005)

(25) Einreichungssprache: Deutsch

(26) Veröffentlichungssprache: Deutsch

(30) Angaben zur Priorität:
20 2004 002 491.8
17. Februar 2004 (17.02.2004) DE

(71) Anmelder *(für alle Bestimmungsstaaten mit Ausnahme von US)*: **KENNAMETAL INC.** [US/US]; 1600 Technology Way, Latrobe, PA 15650-0231 (US).

(72) Erfinder; und

(75) Erfinder/Anmelder *(nur für US)*: **KRENZER, Ulrich** [DE/DE]; Cadolzburger Strasse 16, 90513 Zirndorf (DE). **JUST, Werner** [DE/DE]; Magdeburger Strasse 19, 91438 Bad Windsheim (DE).

(74) Anwalt: **TERGAU & POHL**; Mögeldorfer Hauptstrasse 51, 90482 Nürnberg (DE).

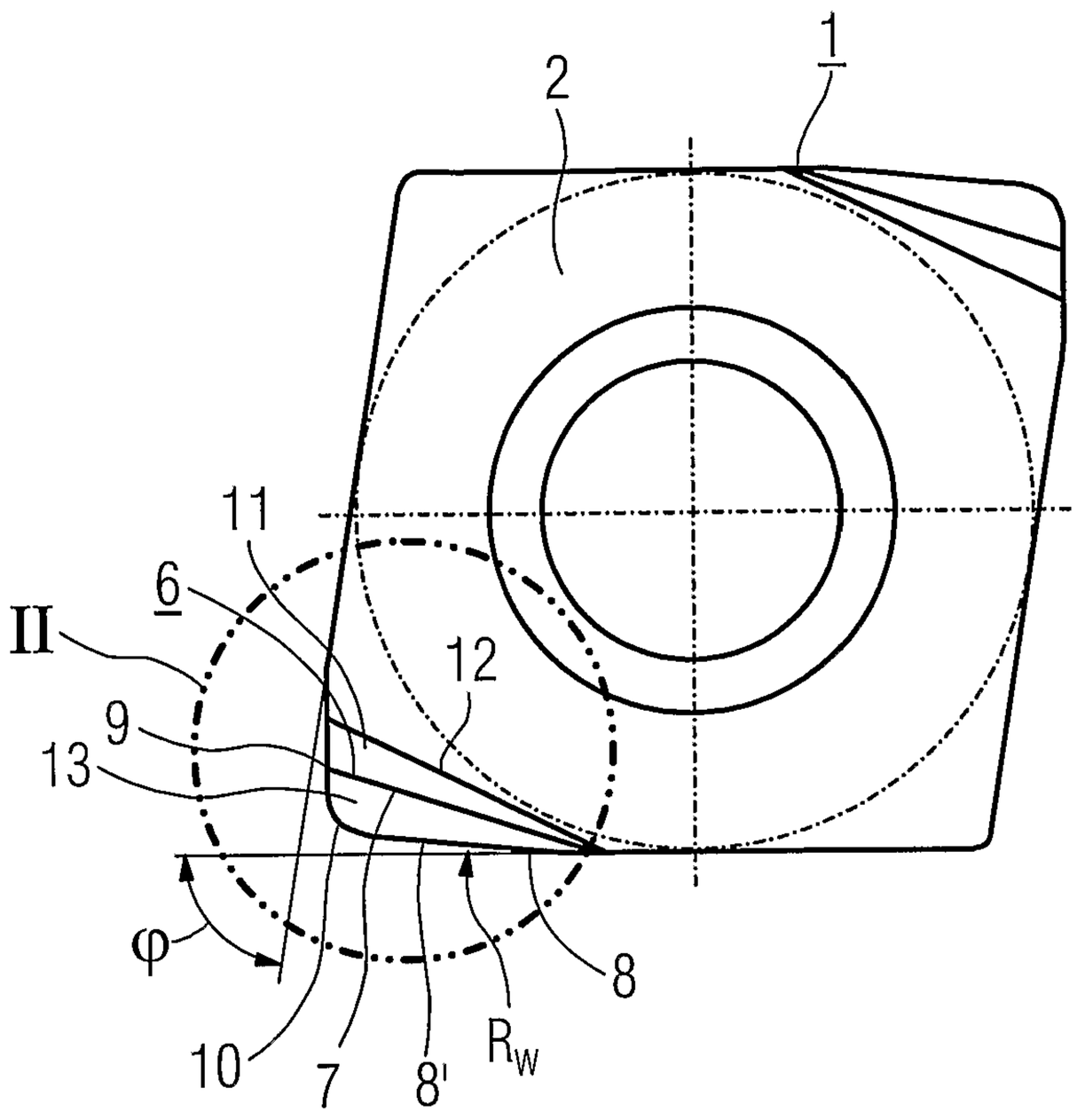
(81) Bestimmungsstaaten *(soweit nicht anders angegeben, für jede verfügbare nationale Schutzrechtsart)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Bestimmungsstaaten *(soweit nicht anders angegeben, für jede verfügbare regionale Schutzrechtsart)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG,

[Fortsetzung auf der nächsten Seite]

(54) Title: CUTTING PLATE, PARTICULARLY FOR A BORING TOOL

(54) Bezeichnung: SCHNEIDPLATTE, INSBESONDERE FÜR EIN AUSDREHWERKZEUG



(57) Abstract: The invention relates to a cutting plate (1) comprising a plate surface (2), lateral plate faces (5), a main cutting edge (9) that borders a secondary cutting edge (8) via a corner cutting edge (10), and a chip-forming stage (6) that is located in the zone near the corner and is provided with a stage base (7) which extends from the secondary cutting edge (8) to the main cutting edge (9).

(57) Zusammenfassung: Die Erfindung betrifft eine Schneidplatte (1) mit einer Plattenoberfläche (2) und Plattenseitenflächen (5), mit einer über eine Eckenschneidkante (10) an eine Nebenschneidkante (8) angrenzenden Hauptschneidkante (9), sowie mit einer im eckennahen Bereich vorgesehene Spanformstufe (6) mit einem sich von der Nebenschneidkante (8) zur Hauptschneidkante (9) erstreckenden Stufengrund (7).

WO 2005/080034 A1

WO 2005/080034 A1

ZM, ZW), eurasisches (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), europäisches (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Veröffentlicht:

— *mit internationalem Recherchenbericht*

— *vor Ablauf der für Änderungen der Ansprüche geltenden Frist; Veröffentlichung wird wiederholt, falls Änderungen eintreffen*

Zur Erklärung der Zweibuchstaben-Codes und der anderen Abkürzungen wird auf die Erklärungen ("Guidance Notes on Codes and Abbreviations") am Anfang jeder regulären Ausgabe der PCT-Gazette verwiesen.

52336-5

Description

CUTTING PLATE, PARTICULARLY FOR A BORING TOOL

The invention relates to an insert with an insert surface and insert side faces, and with a primary cutting edge that adjoins a secondary cutting edge via a corner cutting edge. The invention further relates to a boring tool or drilling tool, in particular with precision adjustment, with such an insert.

A boring tool, in particular a precision boring tool, generally has a fine adjustment device with which an insert that is generally detachably mounted on the tool head can be adjusted in the radial direction, relative to the tool axis, to various bore diameters for the purpose of turning or boring. In that regard, the inserts or cutting inserts that have been used up to now are frequently realized in the form of indexable inserts. An indexable insert has an insert surface and, opposite it, an additional insert face or base surface as well as insert side faces that connect with the insert surface. In the case of a square or rhombic insert, the insert comprises four insert side faces. In the vicinity of an index corner, which can also be realized in the form of a corner cutting edge, adjacent to the corner cutting edge is a primary cutting edge and a secondary cutting edge of the insert.

An object of the invention is to create an improved insert, in particular for a boring tool or precision boring tool, preferably with a precision adjustment device. An additional object of the invention is to create a boring tool with such an insert, in particular for finishing with high finish or surface quality.

For this purpose, in the area near the corner, the insert has a chipbreaker with a base that extends from the secondary cutting edge to the primary cutting edge. The primary cutting edge, which is also referred to below as the major cutting edge, thereby runs diagonally with respect to the insert surface or top face of the indexable insert toward the chipbreaker

base of the chipbreaker. The secondary cutting edge, which is also referred to as the minor cutting edge below and is advantageously straight, descends toward the major cutting edge, as a result of which a wiper geometry is realized on the minor cutting edge. Therefore the major cutting edge and the minor cutting edge preferably form a closed triangle with the chipbreaker base.

In one advantageous configuration, the chipbreaker forms a cutting face that descends from the corner cutting edge to the chipbreaker base. Relative to the insert surface, this cutting face is thus inclined toward the center of the insert. In addition, the chipbreaker forms a rear surface of the cutting face that is also called a back cutting face below, which advantageously ascends from the chipbreaker base toward the insert surface, i.e., it descends from the insert surface toward the chipbreaker base. Consequently, a back upper edge of the back cutting face is formed which extends in the plane of the insert. This back upper edge plus the primary cutting edge and the secondary cutting edge likewise form a triangle.

The base of the chipbreaker is preferably hollowed out in the manner of a channel or a trough with a curved or circular trough or channel crown. The base of the chipbreaker advantageously runs to the primary cutting edge at an angle between 45° and 90°, preferably 70° ± 10°.

In one particularly preferred configuration of the insert, a wiper cutter, i.e., a finishing or wiper cutter using wiper geometry, is realized on its secondary cutting edge. The primary cutting edge and the secondary cutting edge are preferably at an angle of approximately 80° with respect to each other.

The insert, which is preferably realized in the form of an indexable insert, has a negative rake angle between the insert surface and a secondary cutter that runs on the secondary cutting edge toward the corner cutting edge which is preferably between -6° and -20°. A positive rake or side rake angle between the insert surface and the base of the chipbreaker is advantageously between +6° and +30°.

With regard to the boring tool, it preferably includes a precision adjustment device as well as an insert according to the invention which is detachably mounted on the boring tool. The boring tool can thereby be equipped with a replaceably or interchangeably boring or turning head on which the insert is detachably mounted. The insert can also be replaceably mounted in an insert cassette, which for its part is detachably mounted on the periphery of the boring tool or of a precision boring head or precision turning head.

The advantages achieved by the invention consist of the fact that, particularly with the use of an insert according to the invention in a precision boring head or precision turning tool, a comparatively high forward feed (or a larger 1/d ratio) is made possible, whereby vibration problems or inaccuracies are avoided. An additional advantage that is achieved when the insert with the chipbreaker that acts at the primary cutting edge is used, and in particular in combination with the wiper geometry on the secondary cutting edge, is that the chip formed during the boring or turning action during fine boring or fine drilling machining operations is reliably directed away from the boring wall toward the center without damaging the machined surface of the boring, e.g., by scratching it.

A particularly fine or smooth surface with a high finish or surface quality with especially low surface roughness that is obtained by the use of an insert as claimed by the invention during the boring or precision boring of a workpiece, i.e., particularly during the finishing operation, is advantageously achieved in that as a result of the geometry claimed by the invention, the chipbreaker does not run parallel to the primary cutting edge, but instead extends at an angle of 45° to less than 90° in relation to it.

In accordance with one aspect of the invention, there is provided a cutting insert comprising an insert surface and insert side faces and comprising a main cutting edge, adjoining a secondary cutting edge via a corner cutting edge and a chip breaker groove provided in a region close to the corner and having a groove root extending from the secondary cutting edge to the main cutting edge, the cutting insert further comprising a negative rake angle (α) between the insert surface and a secondary lip in the course of the secondary cutting edge towards the corner cutting edge.

Embodiments of the invention are explained in greater detail below with reference to the accompanying drawing, in which:

Fig. 1 is an overhead view of an insert as claimed by the invention,

Fig. 2 is a detail from Figure 1 on an enlarged scale of the insert in the vicinity of an insert corner with a chipbreaker according to the invention,

Fig. 3 shows the insert in a side view of the chipbreaker,

Figs. 4 and 5 are views of various details of the insert,

Figs. 6 to 12 present various views of the insert, particularly in the vicinity of the chipbreaker,

Fig. 13 shows a boring tool with a precision adjustment device and insertable tool head or boring head,

Fig. 14 shows a turning or boring head for a boring tool as illustrated in Fig. 13 with an insert as claimed by the invention,

Fig. 15 is an exploded view in perspective of a precision-adjustable boring tool or drilling tool with a detachable insert cassette, and an insert according to the invention detachably mounted therein.

Parts that correspond to each other have been given the same reference number in all the figures.

The insert 1 that is shown in Figures 1 through 5 and in various views in Figures 6 through 12 has an insert surface 2 and an additional insert surface 4, which is also called the base surface below, as well as four insert side faces 5. The latter run between the two insert surfaces 2 and 4, preferably at an acute or obtuse angle. The shape of the insert 1 can also be rhombic, triangular or polygonal, e.g., hexagonal.

Provided in the region of the insert 1 near the corner is a chipbreaker 6. The chipbreaker forms a chipbreaker base 7, which extends from a secondary cutting edge 8 to a primary cutting edge 9 of the insert 1. In this region near the corner, which is shown on an enlarged scale in Figure 2, the insert 1 has a corner cutting edge 10. This corner cutting edge is provided with a specified corner or insert radius, e.g.. (R_S = 0.4), and is thus rounded.

As can be seen in particular from Figures 1 and 2 as well as Figures 8 through 12, the secondary cutting edge 8 and the primary cutting edge 9 together with the chipbreaker base 7 form a triangle or triangular face. A chipbreaker 6 cutting face back 11 that extends from the chipbreaker base 7 to the insert surface 2 forms a back upper edge 12 at the insert surface 2. This back upper edge 12 also forms a triangle or triangular face together with the secondary cutting edge 8 and the primary cutting edge 9. The cutting face back 11 thereby ascends from the chipbreaker base 7 to the insert surface 2. In other words, the cutting face back 11 descends from the back upper edge 12 on the insert surface 2 to the chipbreaker base 7.

The chipbreaker 6 additionally forms a cutting face 13. The latter in turn extends in a triangular shape or triangular face shape between the chipbreaker base 7 and the primary cutting edge 9 and secondary cutting edge 8. The cutting face 13 descends from the corner cutting edge 10 to the chipbreaker base 7. In other words, the cutting face 13 is inclined from the corner cutting edge 6 toward the insert surface 2.

As can be seen from Figure 3 as well as from Figures 7 though 12, the chipbreaker base is formed with a channel-like or trough-like shape. The chipbreaker base bottom 14 of the chipbreaker base 7 is thus curved convexly relative to the insert surface 2, i.e., it is hollowed out of the insert 1 or is recessed into the insert 1 in the form of a trough and is thus curved.

As can be seen from Figure 1, the secondary cutting edge 8 and the primary cutting edge 9 run toward each other at an acute angle φ, preferably at $\varphi = 80°$. A negative rake angle α in Figure 2 between the insert surface 2 and a secondary cutter 8' in the progression from the secondary cutting edge 8 toward the corner cutting edge 10 lies particularly preferably between $\alpha = -6°$ and $\alpha = -20°$. A positive side angle or side rake ß between the insert surface 2 and the chipbreaker base 7 of the chipbreaker 6 is preferably between ß = +6° and ß = 30°.

The secondary cutting edge 8 is designed using wiper geometry R_W. In this wiper geometry, the secondary cutting edge 8 and the secondary cutter 8' act as a finishing or wiper cutter. The associated wiper radius R_W is $R_W = 5.0$. The primary cutting edge 9 thereby runs at an angle with respect to the insert surface or top face 2 of the cutting insert 1 toward the chipbreaker base 7 of the chipbreaker 6. The secondary cutting edge 8 is straight and descends toward the primary cutting edge 9 and thereby realizes the wiper geometry on the secondary cutting edge or secondary cutter 9. The primary cutting edge 9 and the secondary cutting edge 8 as well as the chipbreaker base 7 preferably form a closed triangle.

Figures 13 and 15 each show a boring tool 20 with a precision adjustment device 21. With this fine adjustment device 21, the insert 1 claimed by the invention that is detachably mounted on the boring tool or precision boring tool 20 can be adjusted with precision in the radial direction R, i.e. transverse to the axis direction A of the tool 20. A range of bore diameters can thus be bored or turned by using this precision adjustment capability.

In the case of the boring tool 20 shown in Figure 13, shown inserted in it and on an enlarged scale in Figure 14 is a boring head 22. This boring head 22 carries, on the cutter or head end 23 on the peripheral side, the insert 1 claimed by the invention with chipbreaker 6 and wiper geometry 8', R_W on the secondary cutting edge 8. The insert 1 can thereby be detachably mounted, e .g., by means of a screw 24, on the front head end 23 of the boring head 22.

In the case of the boring tool 20 shown in Figure 15, it is realized on the front head end 23 with a recess 25 for seating n insert cassette 26. The insert cassette 26 has an insert recess 27 for seating the insert 1 as claimed by the invention, which is in turn detachably mounted there by means of a screw 24. The insert cassette 26 is likewise detachably mounted, e.g. by means of a screw 28, on the outer periphery of the boring tool 20.

52336-5

CLAIMS:

1. A cutting insert comprising an insert surface and insert side faces and comprising a main cutting edge, adjoining a secondary cutting edge via a corner cutting edge and a chip breaker groove provided in a region close to the corner and having a groove root extending from the secondary cutting edge to the main cutting edge, the cutting insert further comprising a negative rake angle (α) between the insert surface and a secondary lip in the course of the secondary cutting edge towards the corner cutting edge.

2. The cutting insert according to Claim 1, wherein the main cutting edge and the secondary cutting edge and the groove root define a triangle.

3. The cutting insert according to Claim 1 or 2, wherein the chip breaker groove forms a rake face which falls towards the groove root starting from the corner cutting edge.

4. The cutting insert according to any one of Claims 1 to 3, wherein the chip breaker groove forms a back rake face which rises towards the insert surface starting from the groove root.

5. The cutting insert according to any one of Claims 1 to 4, wherein the groove root of the chip breaker groove is of channel-like design.

6. The cutting insert according to any one of Claims 1 to 5, wherein the groove root of the chip breaker groove runs at an angle (δ) of greater than or equal to 45° up to less than 90°, to the main cutting edge.

7. The cutting insert according to Claim 6 wherein the groove root of the chip breaker runs at an angle (δ) of 70 ± 10° of the main cutting edge.

8. The cutting insert according to any one of Claims 1 to 6, wherein a finishing or wiping lip in wiper geometry is formed on the secondary cutting edge.

9. The cutting insert according to any one of Claims 1 to 8, wherein the negative rake angle (α) is between -6° and -20°.

10. The cutting insert according to any one of Claims 1 to 9, comprising a positive side rake angle (β) between the insert surface and the groove root of the chip breaker groove, the positive rake angle (β) being between +6° and +30°.

11. The cutting insert according to any one of Claims 1 to 10, wherein the main cutting edge and the secondary cutting edge run at an acute angle (φ), to one another.

12. The cutting insert according to Claim 11 wherein the main cutting edge and the secondary cutting edge run at an angle (φ) to one another.

13. A boring tool, having a fine-setting device comprising a detachably held cutting insert according to any one of Claims 1 to 12.

14. The boring tool according to Claim 12 having a detachable boring or turning head, on which the cutting insert is held.

15. The boring tool according to Claim 12, to which an insert cassette accommodating the cutting insert is detachably fastened.

FIG 1

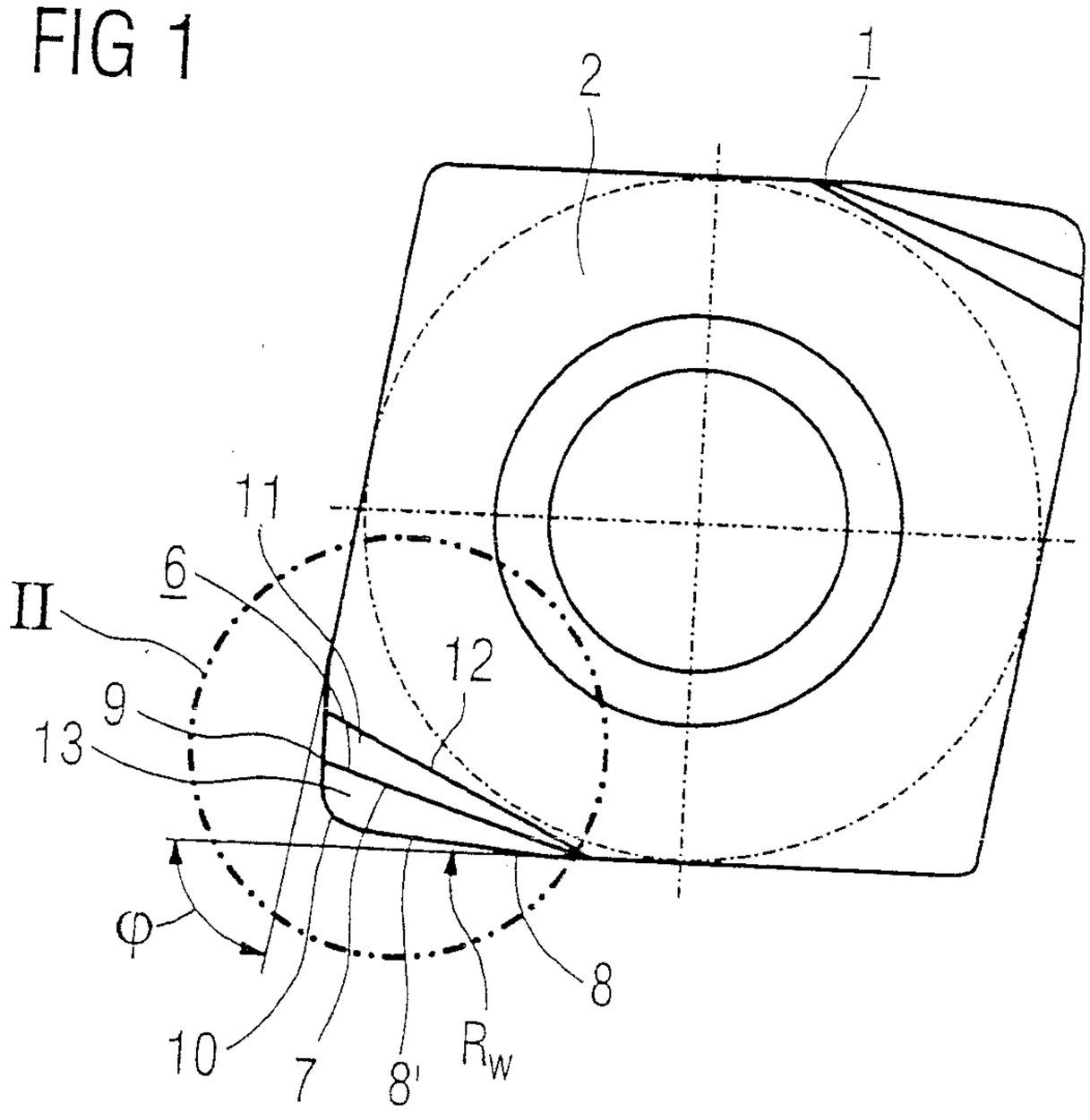


FIG 2

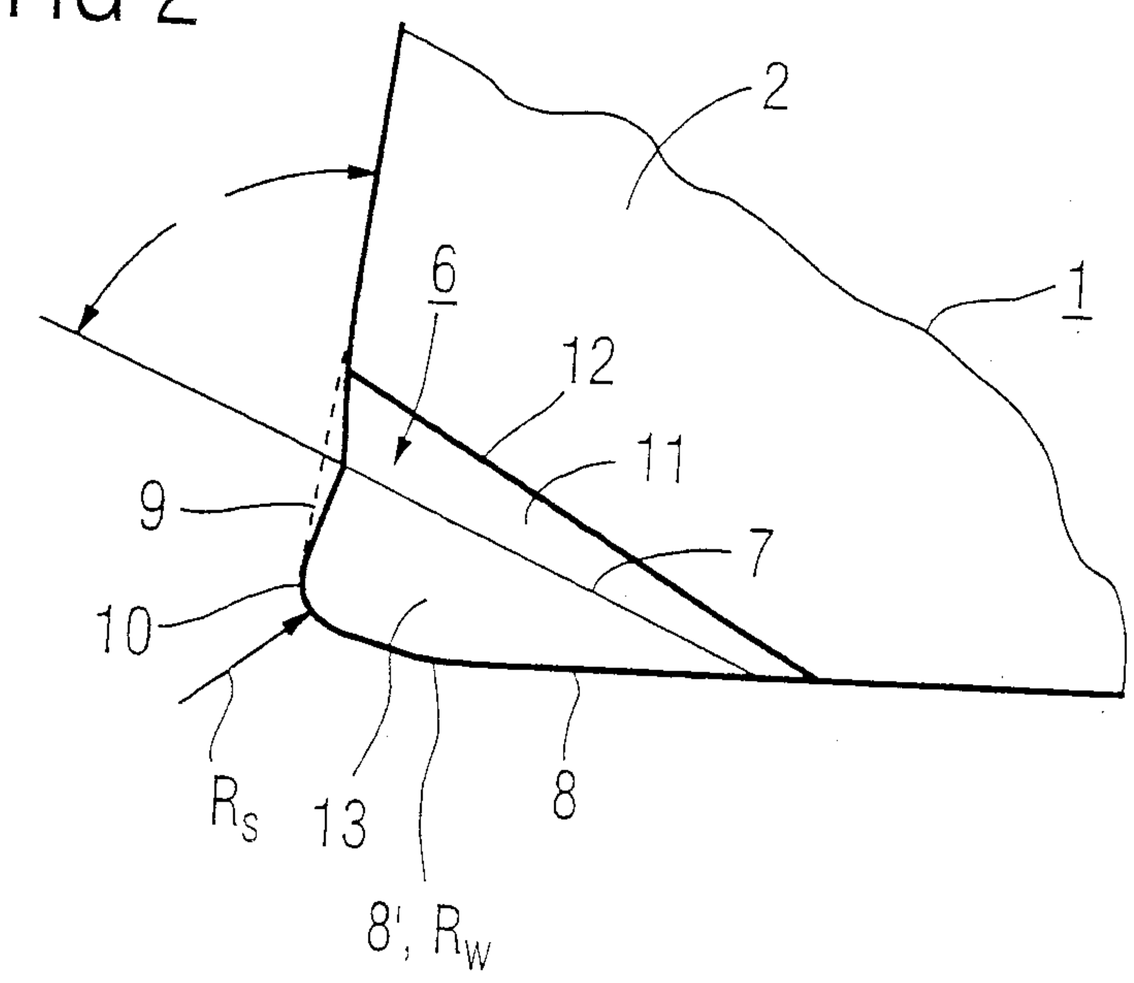


FIG 3

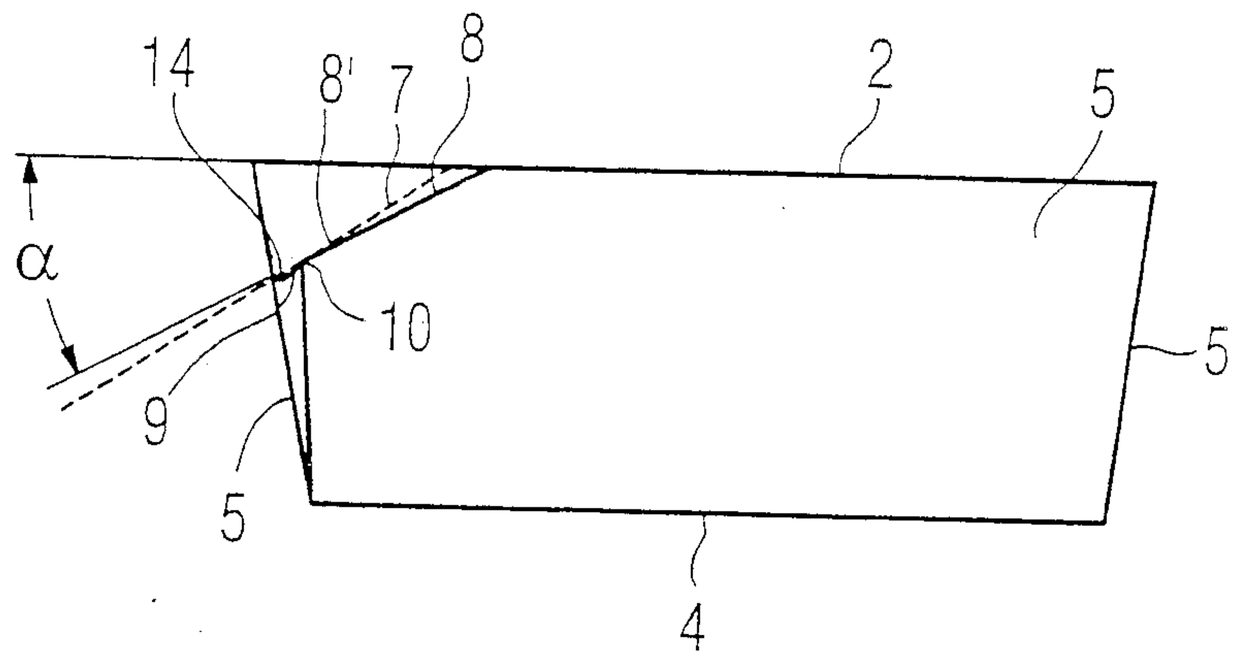


FIG 4

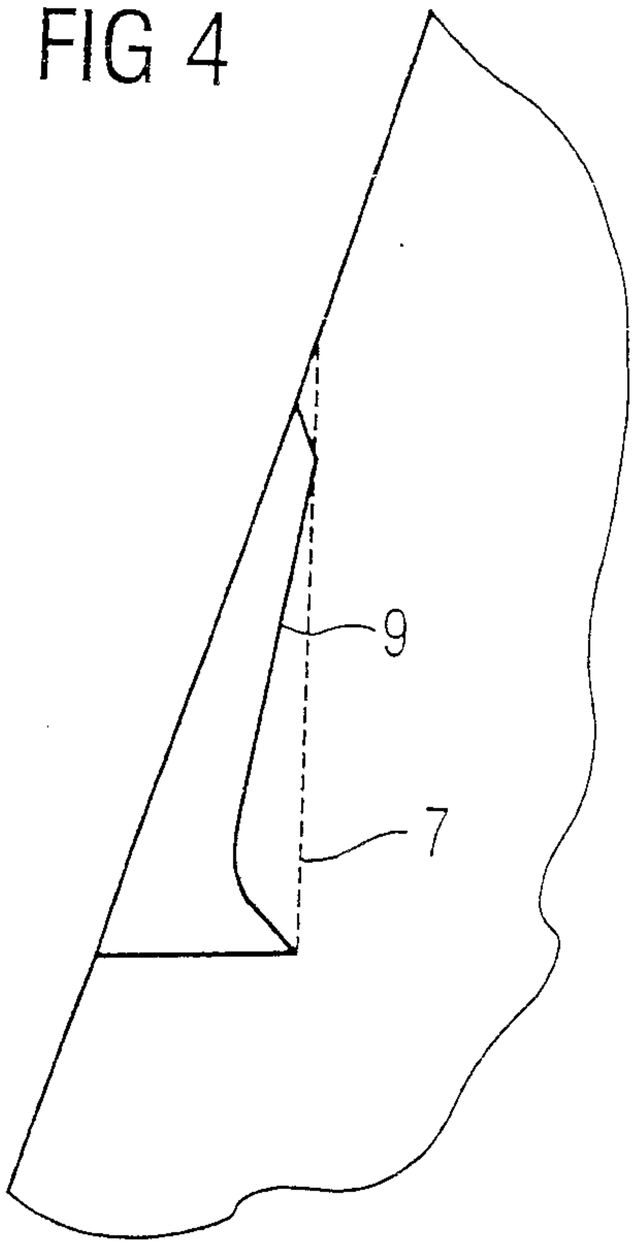


FIG 5

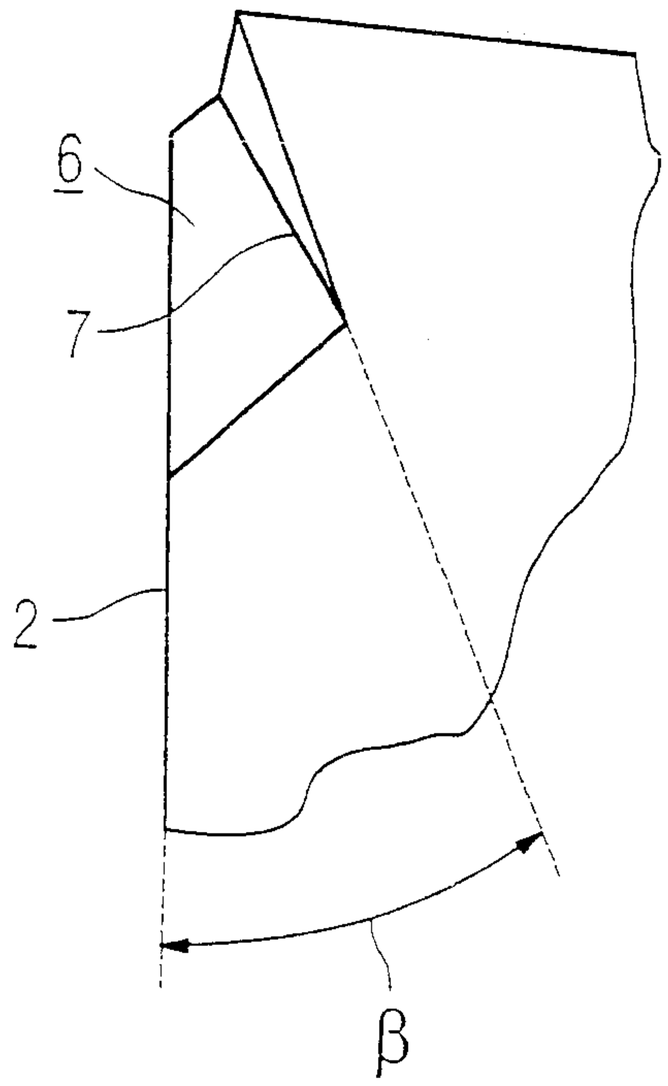


FIG 6

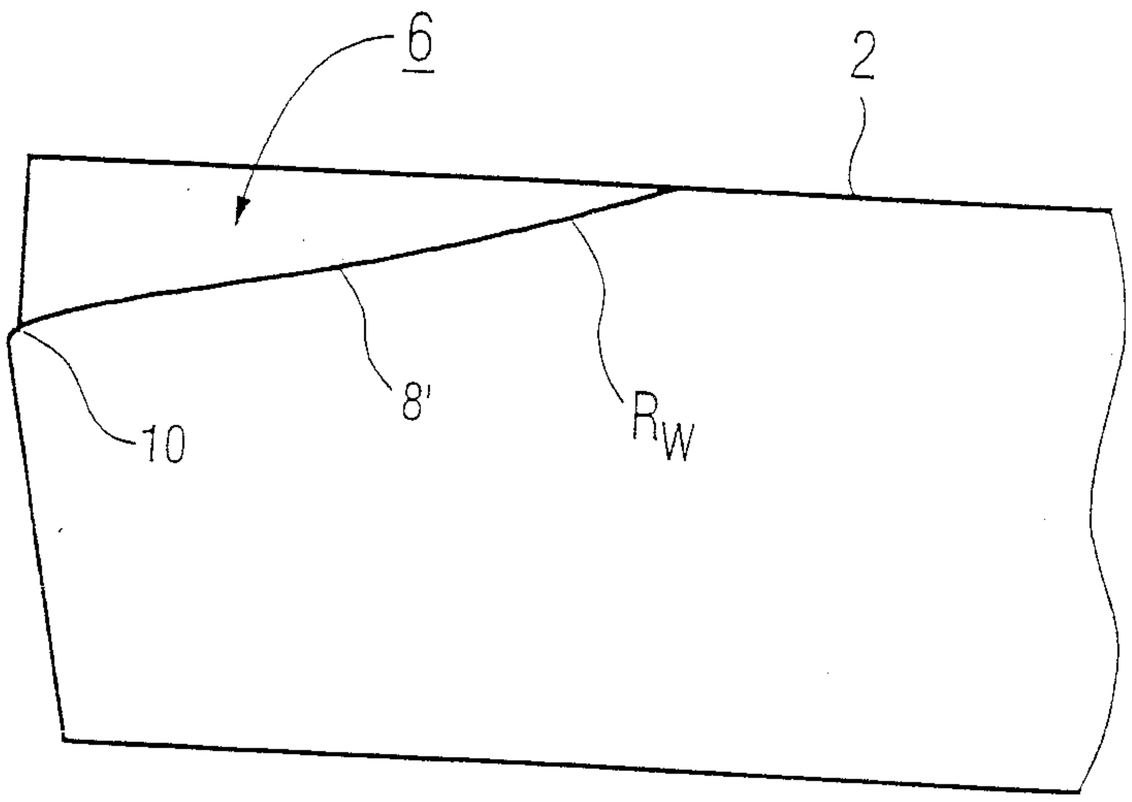


FIG 7

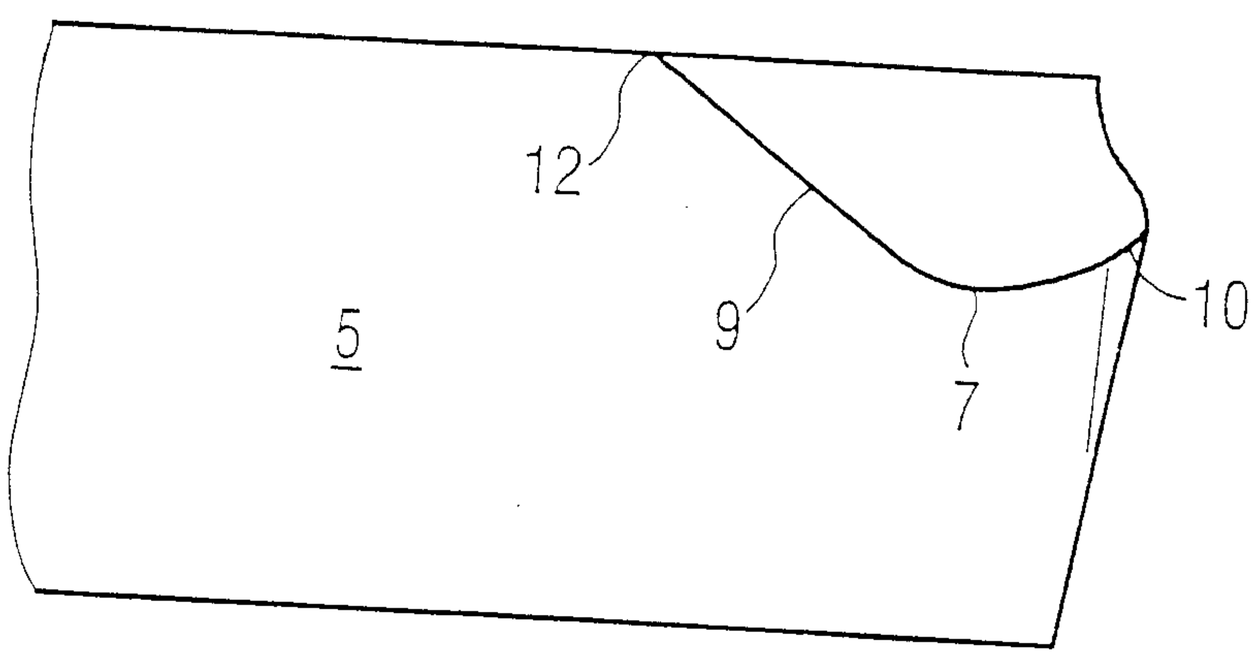


FIG 8

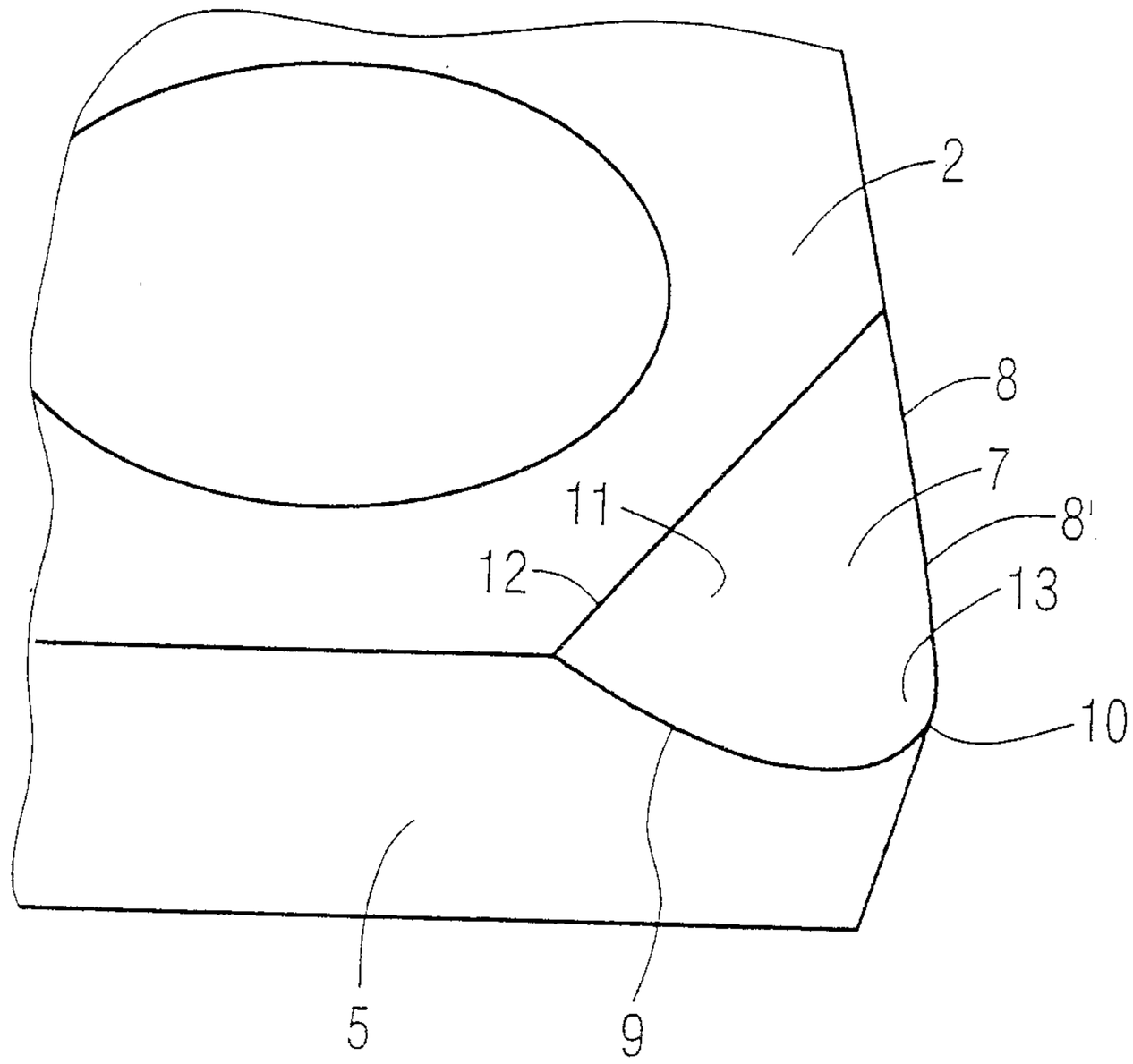


FIG 9

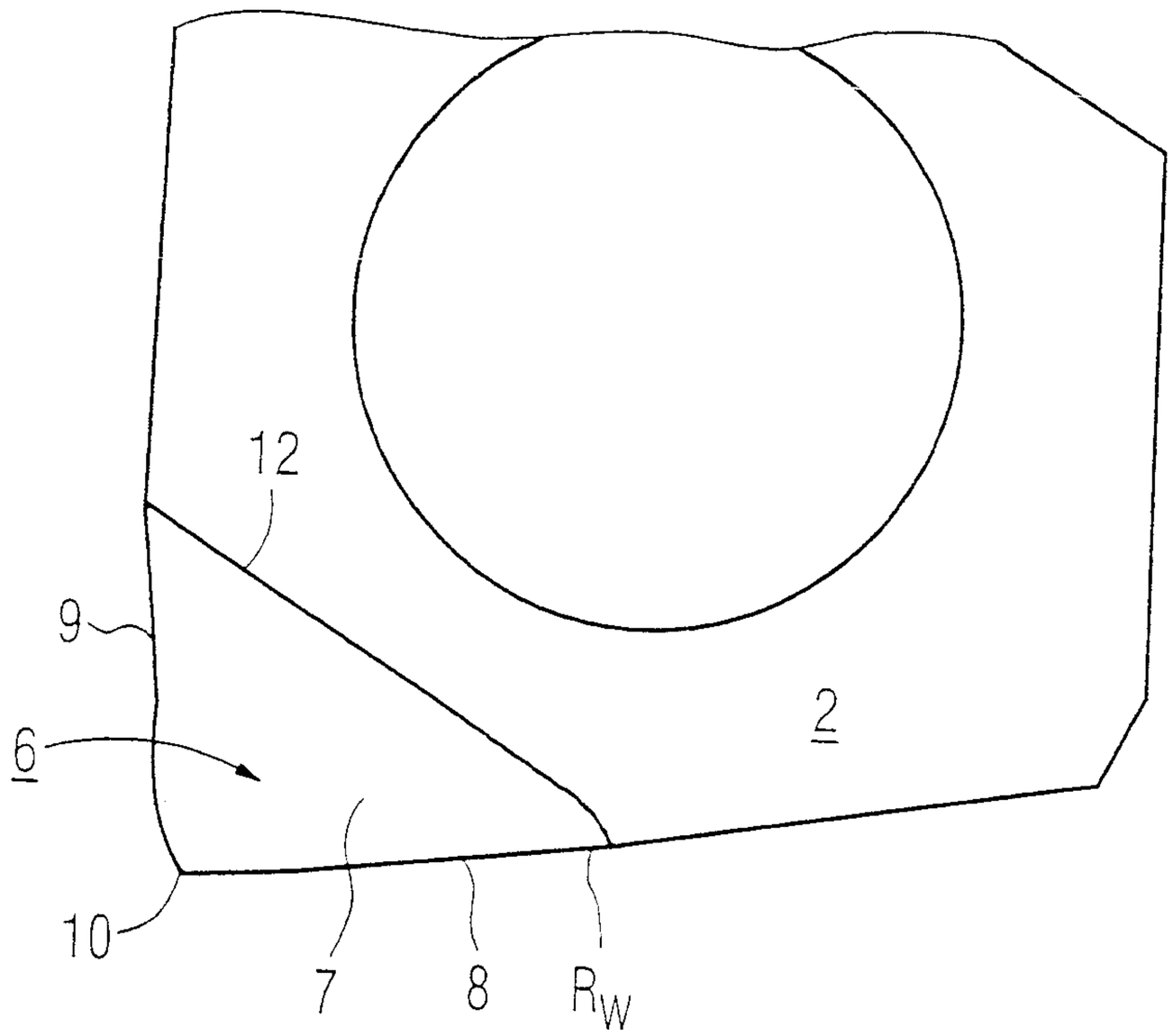


FIG 10

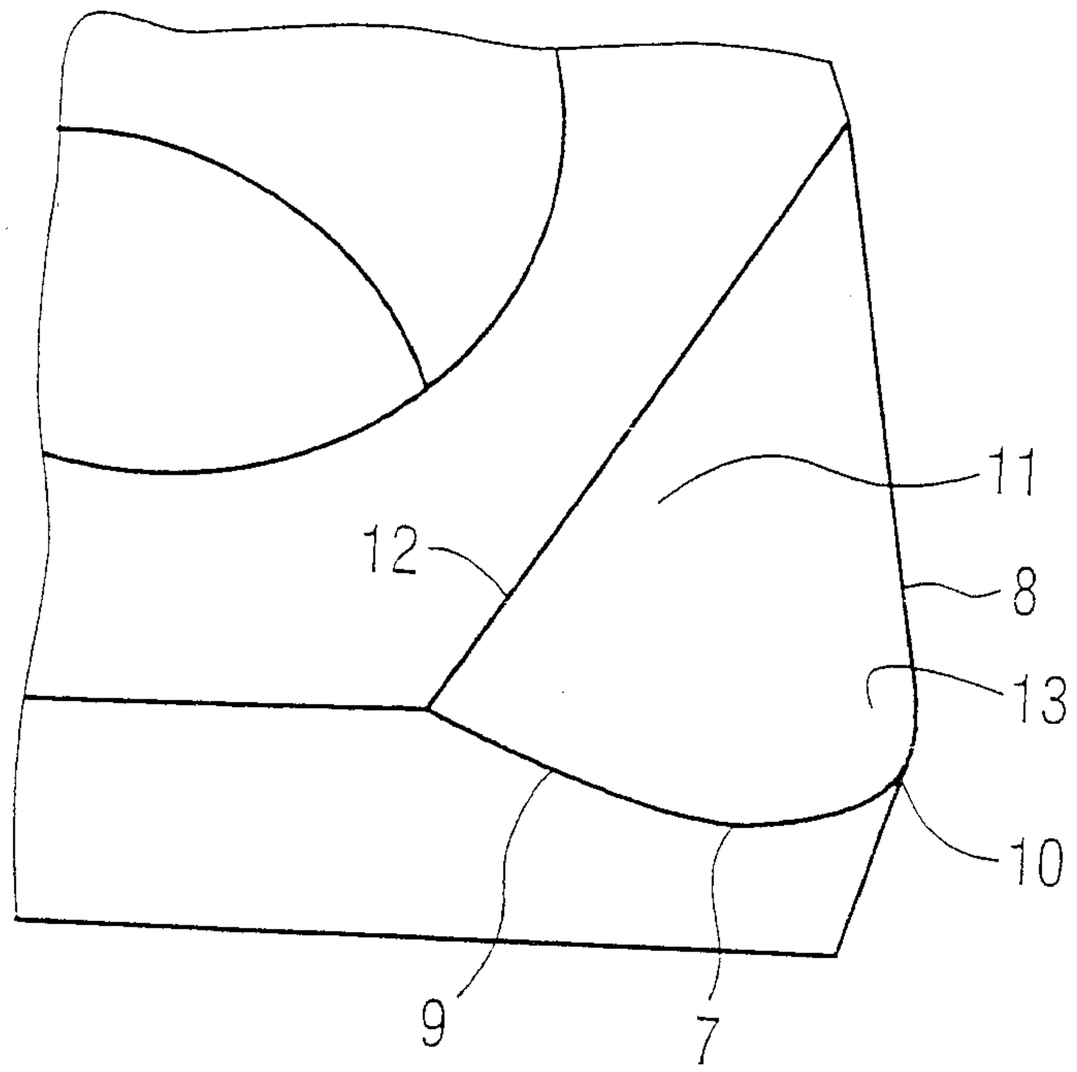


FIG 11

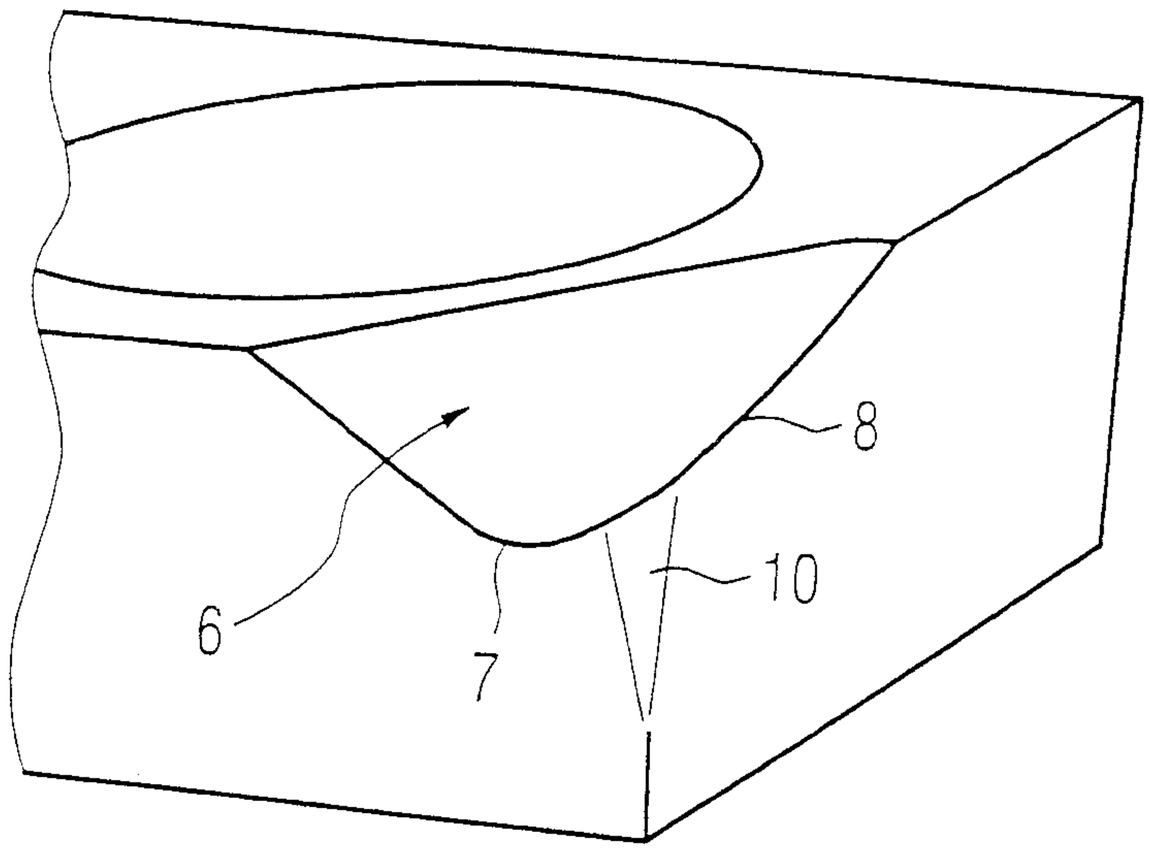


FIG 12

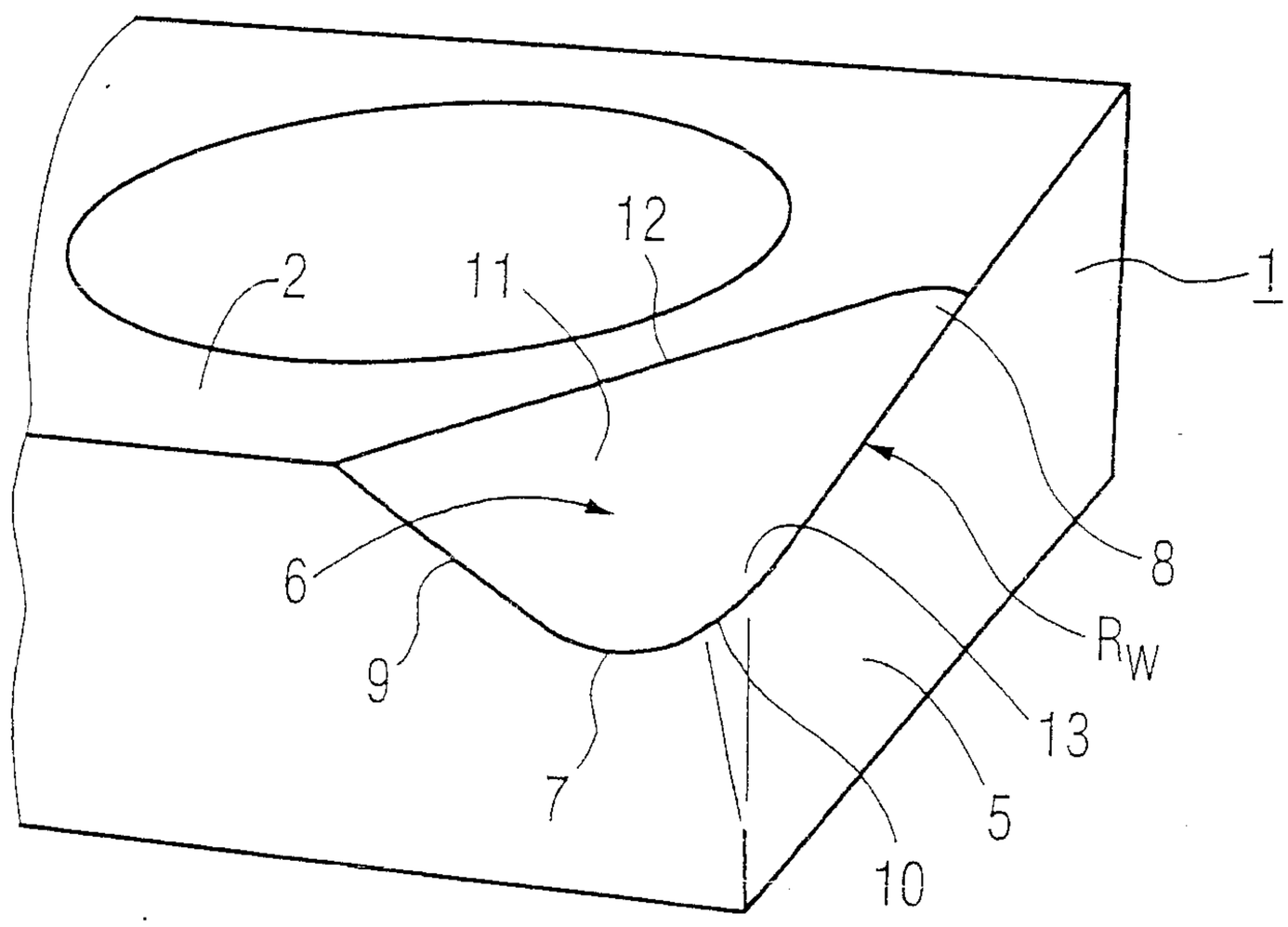


FIG 13

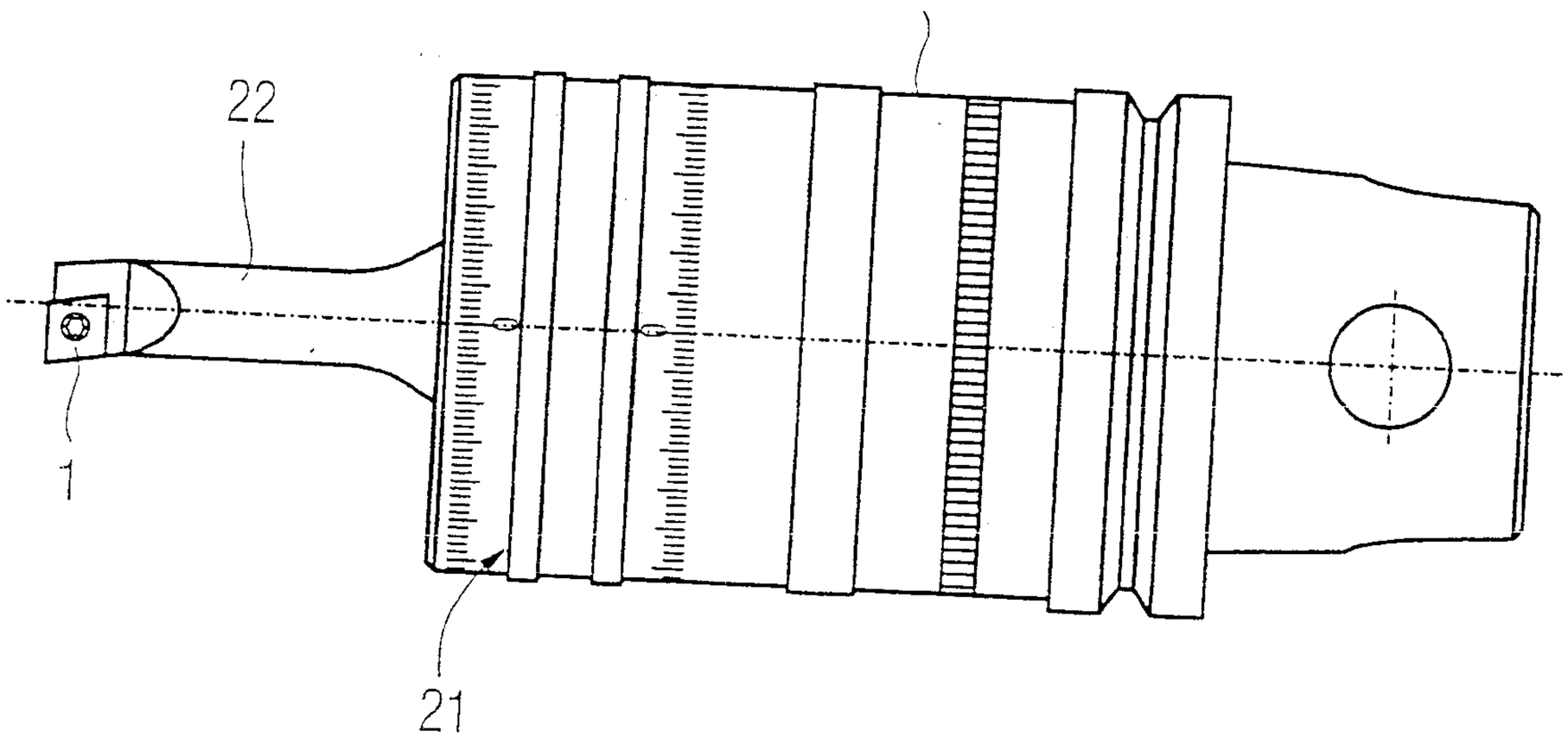


FIG 14

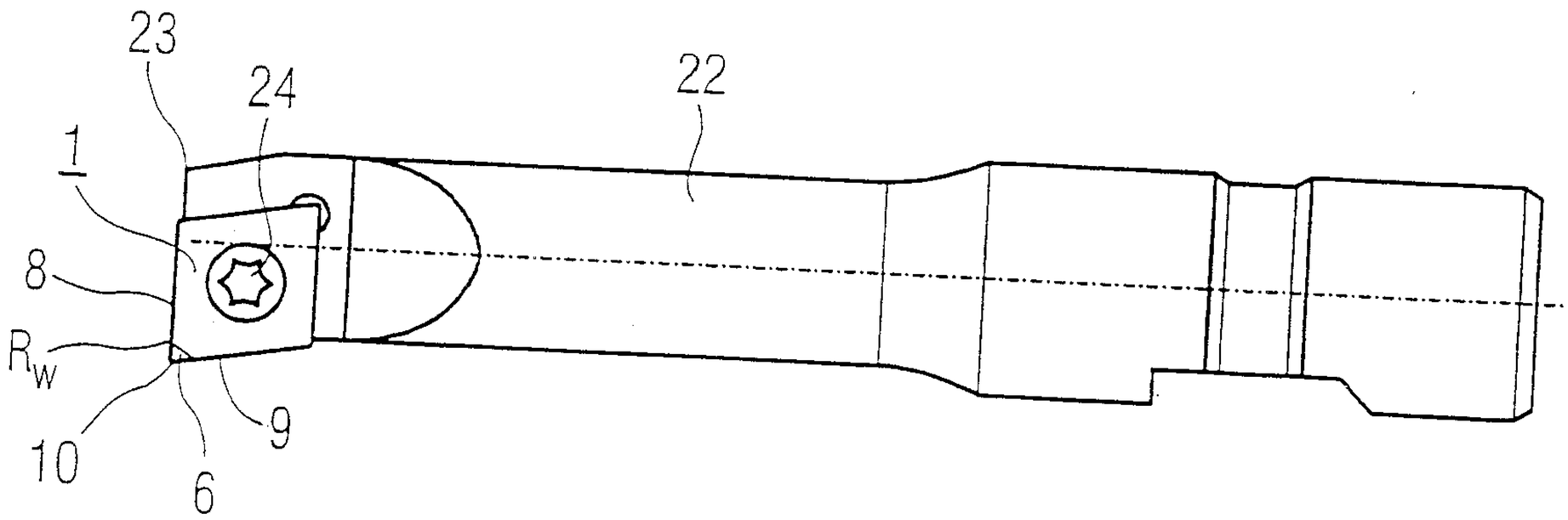
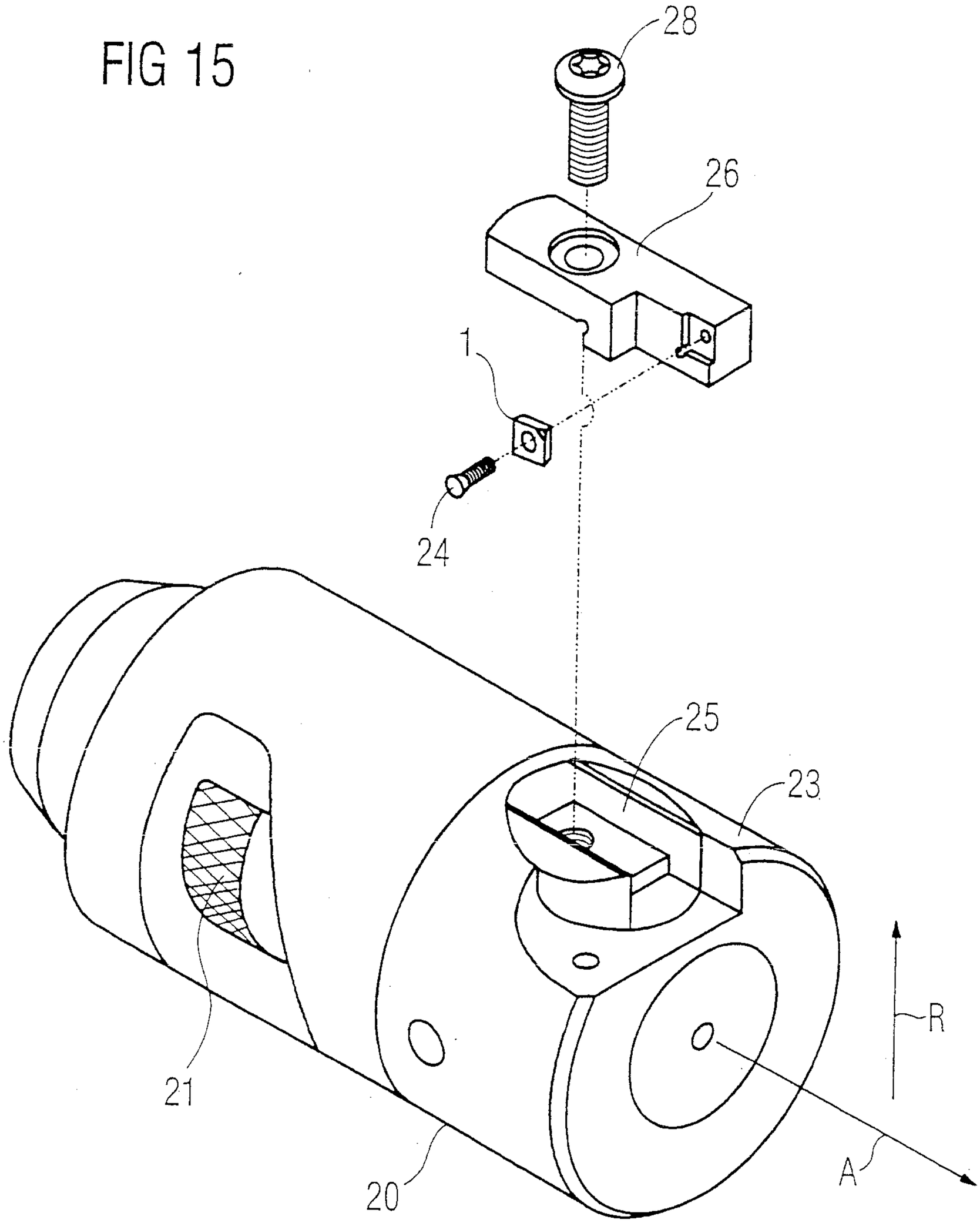
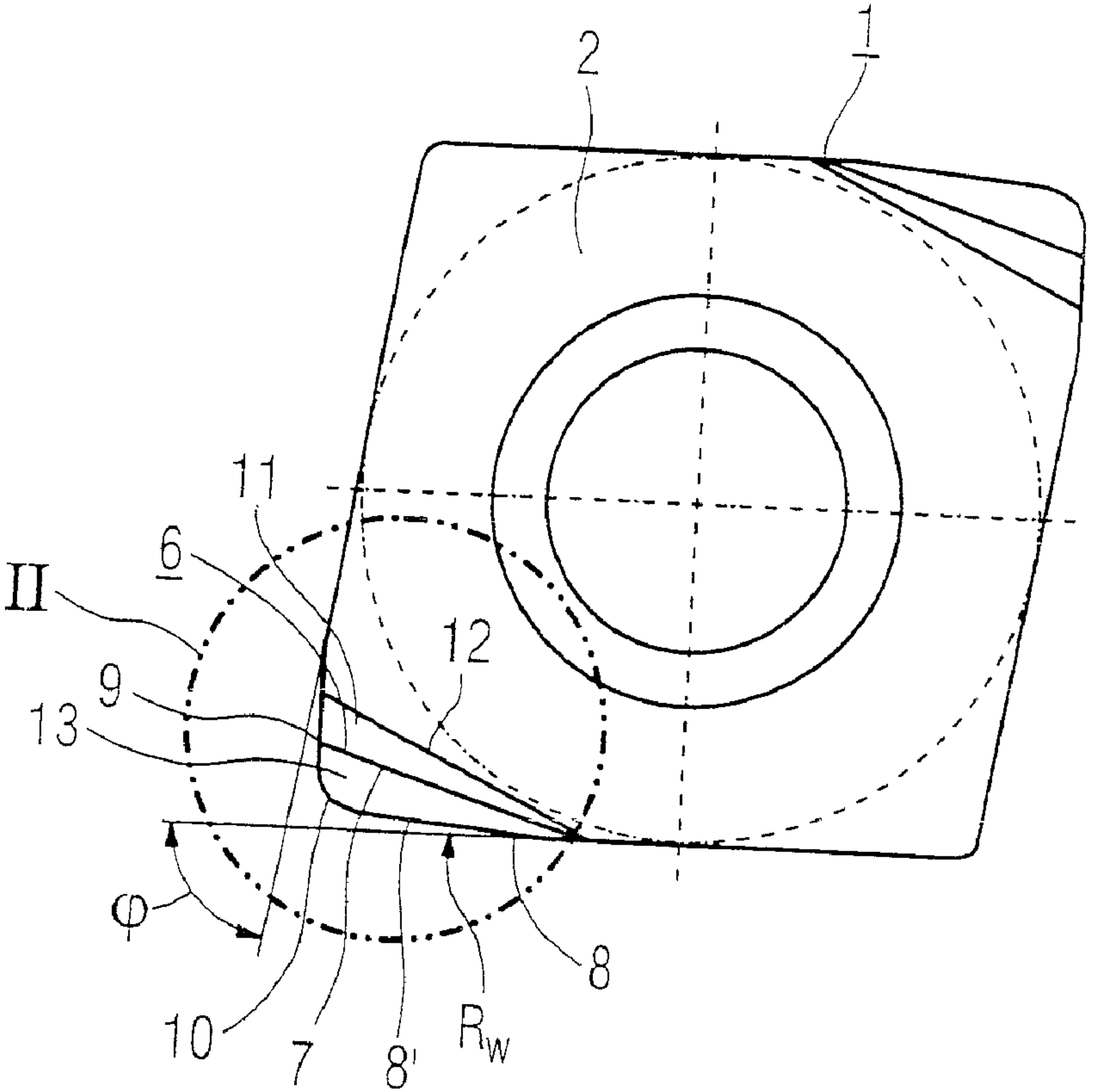


FIG 15




1
2
11
6
II
12
9
13
φ
8
10
7
8'
R_W